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The Michigan Dune Alliance:
Collaborating to Restore Eastern Lake Michigan Coastal Ecosystems

Presented by Shaun Howard – *Eastern Lake Michigan Project Manager*

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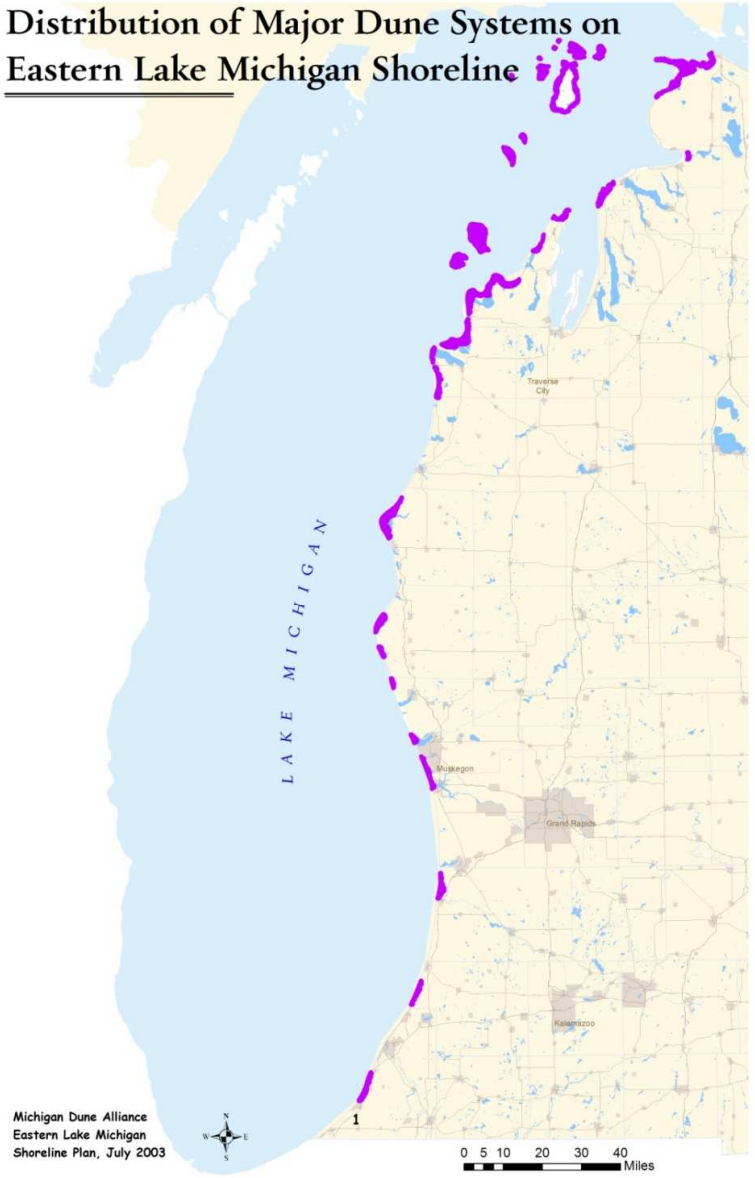
Michigan Dunes

Unique Ecosystems…



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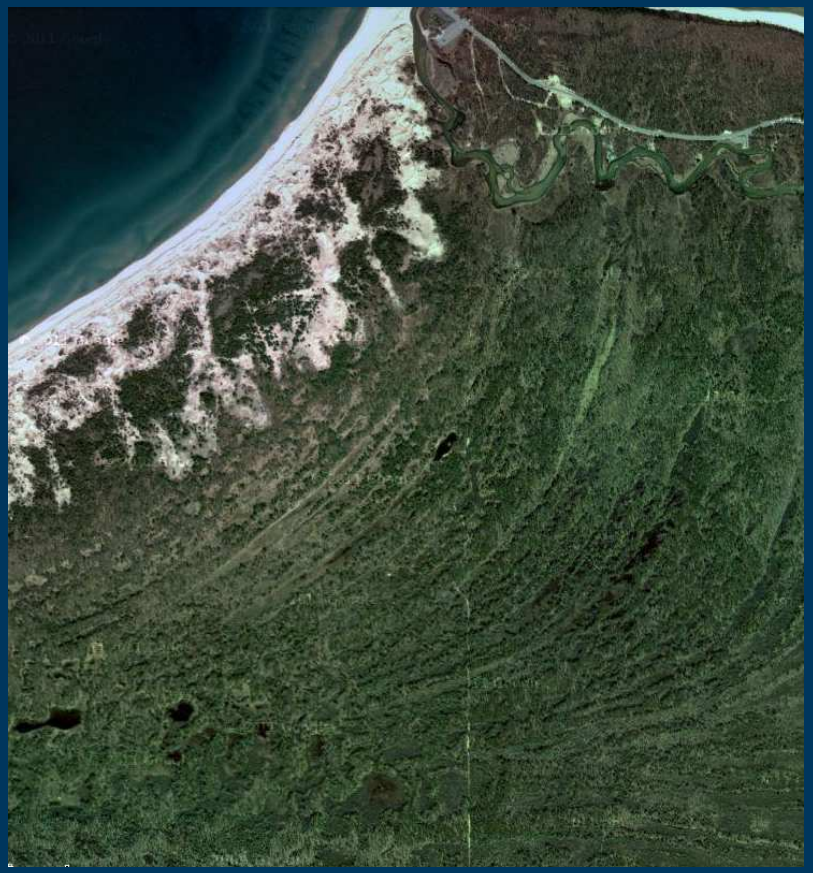
Michigan Dunes
Unique Ecosystems…



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…Supporting Unique Species…

Pitcher's thistle (*Cirsium pitcheri*)

Piping plover (*Charadrius melodus*)

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...and an Iconic Michigan Landscape...

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...Under Threat from Invasives

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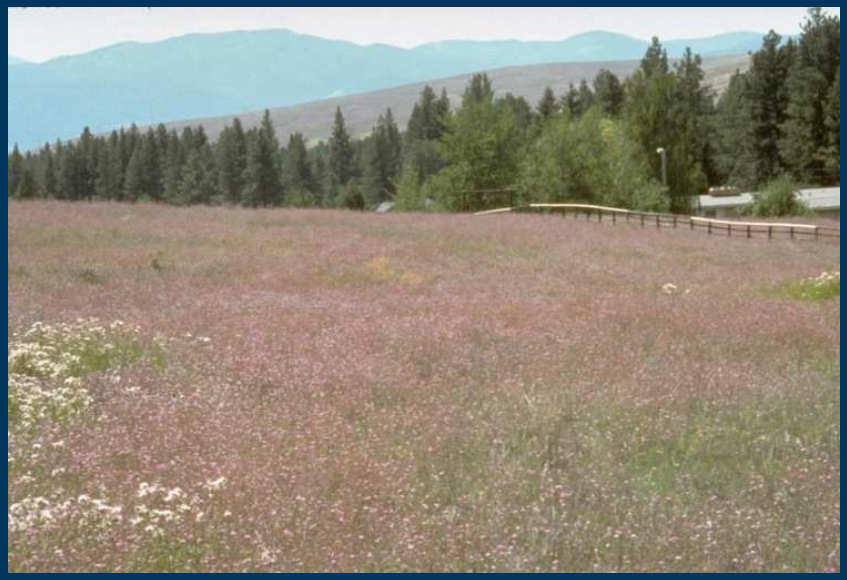
What are Invasive Species?

"Invasives are species outside of their natural distribution range that negatively affect the habitat or region they invade"

IMPACTS

Ecological



Economic

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Conservation at Scale: The Michigan Dune Alliance

MDA founded in 1999 by MDEQ Office of the Great Lakes

- Built as a coalition dedicated to the conservation of dunes and shoreline
- Focused on coordinating and building capacity of land conservancies along the Lake Michigan coast

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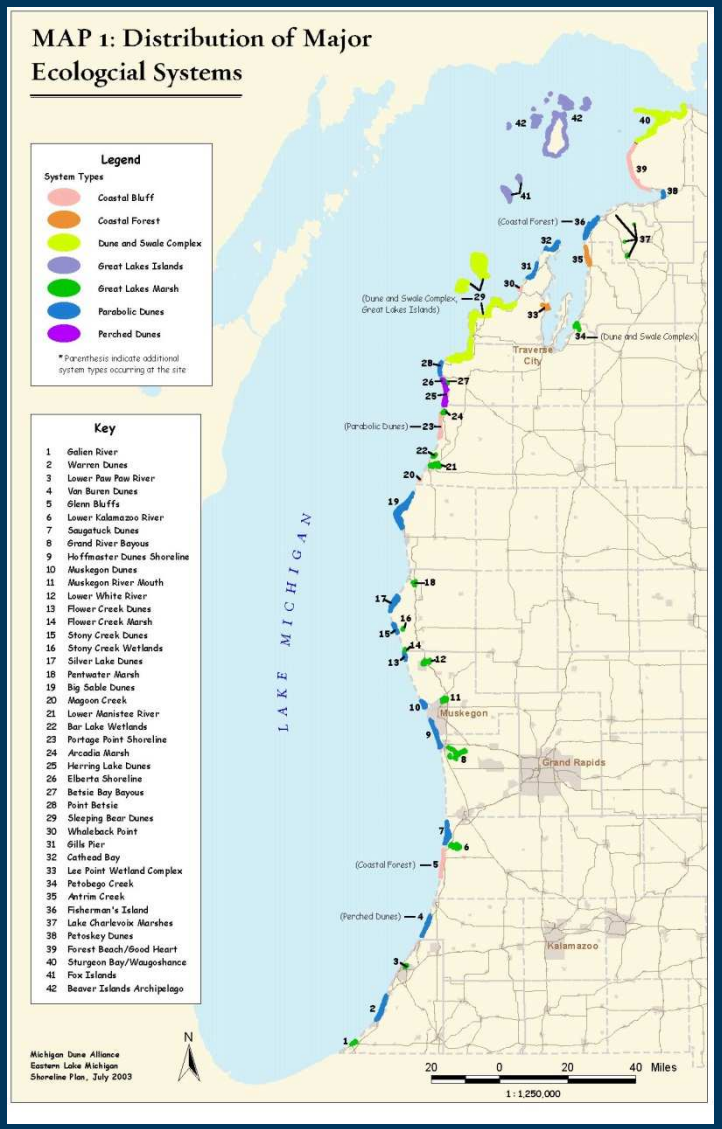
Conservation at Scale: The Michigan Dune Alliance

2001 - Lake Michigan Coastal Threat Assessment

- Survey of 42 sites for invasive species
- Data collection to avoid a "ready, shoot, aim" scenario



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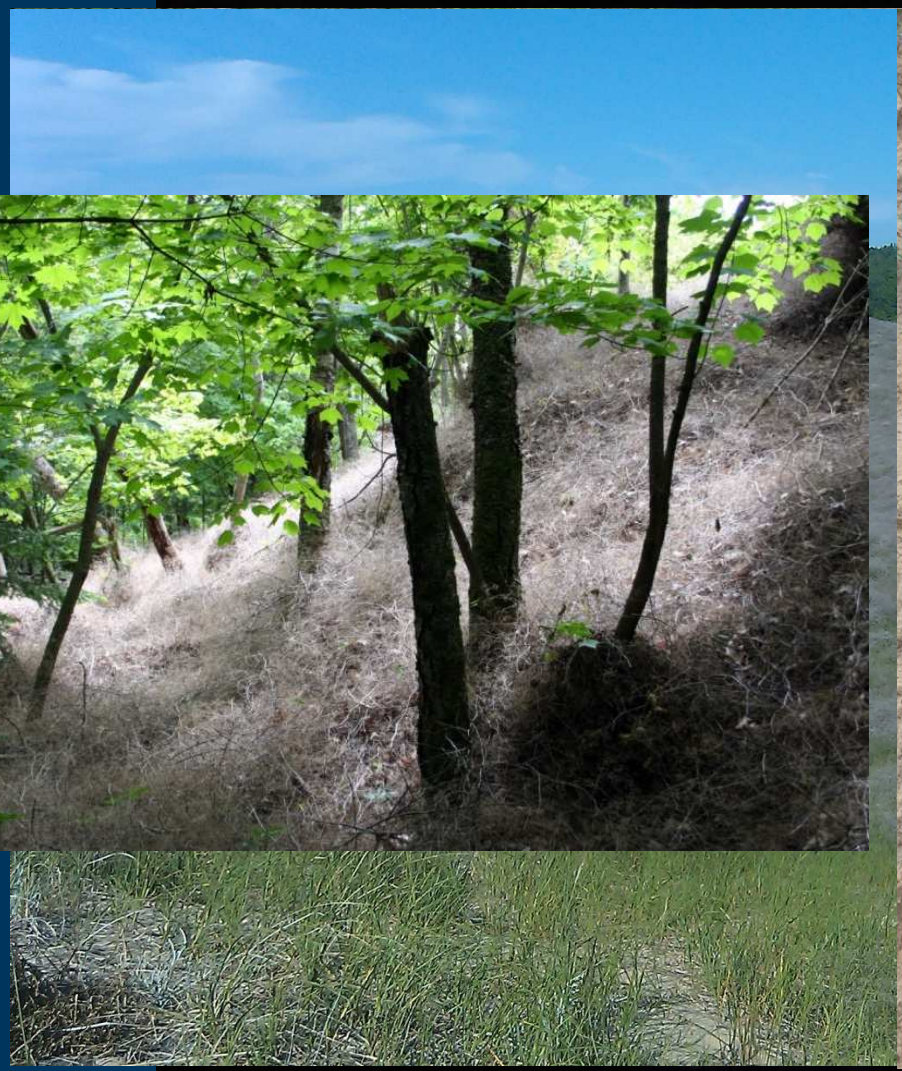
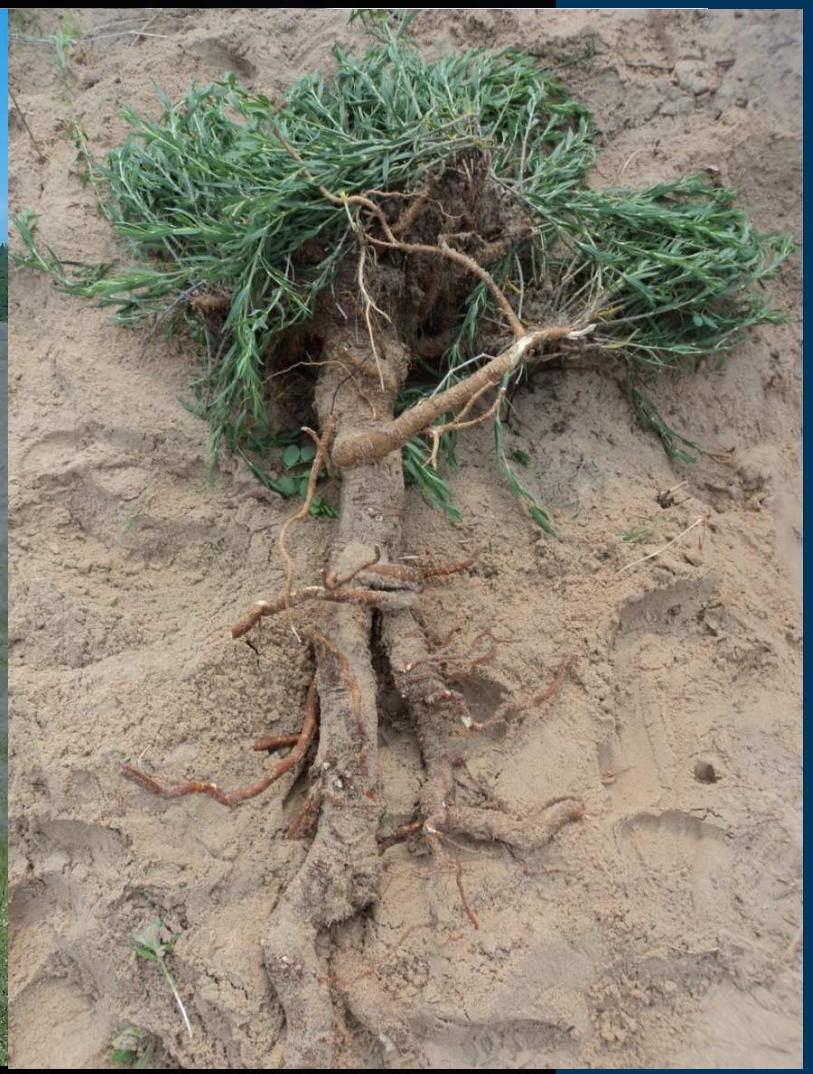
Baby's-breath (*Gypsophila paniculata)*





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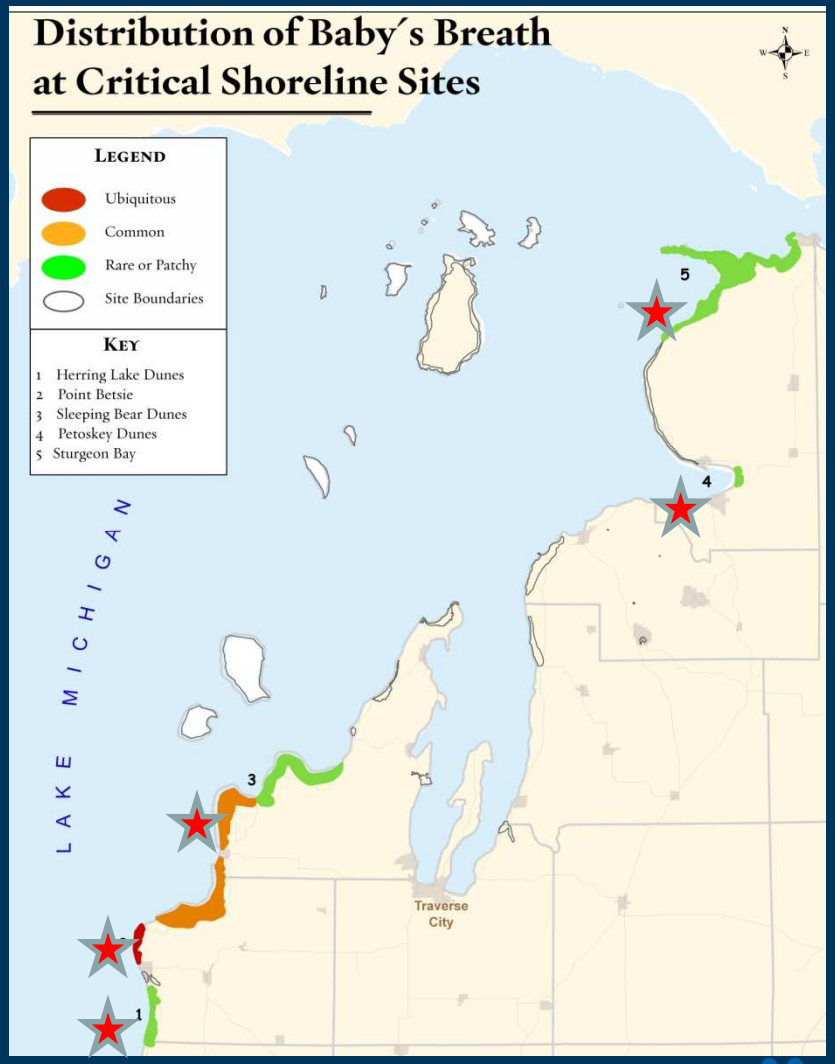
Lake Michigan Coastal Restoration Project

Effectively eliminate baby's-breath from the dune systems of Northwest Lower Michigan

Project is currently **on schedule**

- ~1,800 acres originally infested
- In 8 years, over 85% of all baby's-breath populations have received control treatments
- Eradication at Wilderness State Park
- "Maintenance level" at Petoskey State Park



meijer

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Zetterberg Preserve - 2006

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Zetterberg Preserve - 2010

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Conservation at Scale: The Michigan Dune Alliance

2001 - Lake Michigan Coastal Threat Assessment

- Survey of **42 SITES** for invasive species
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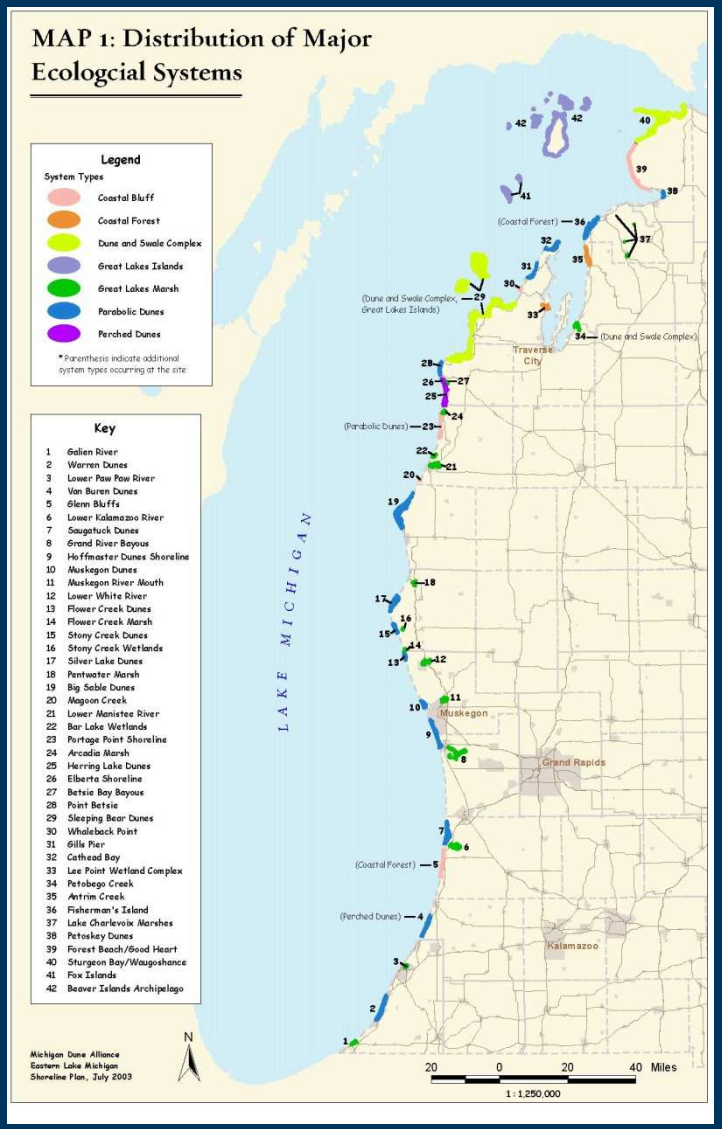

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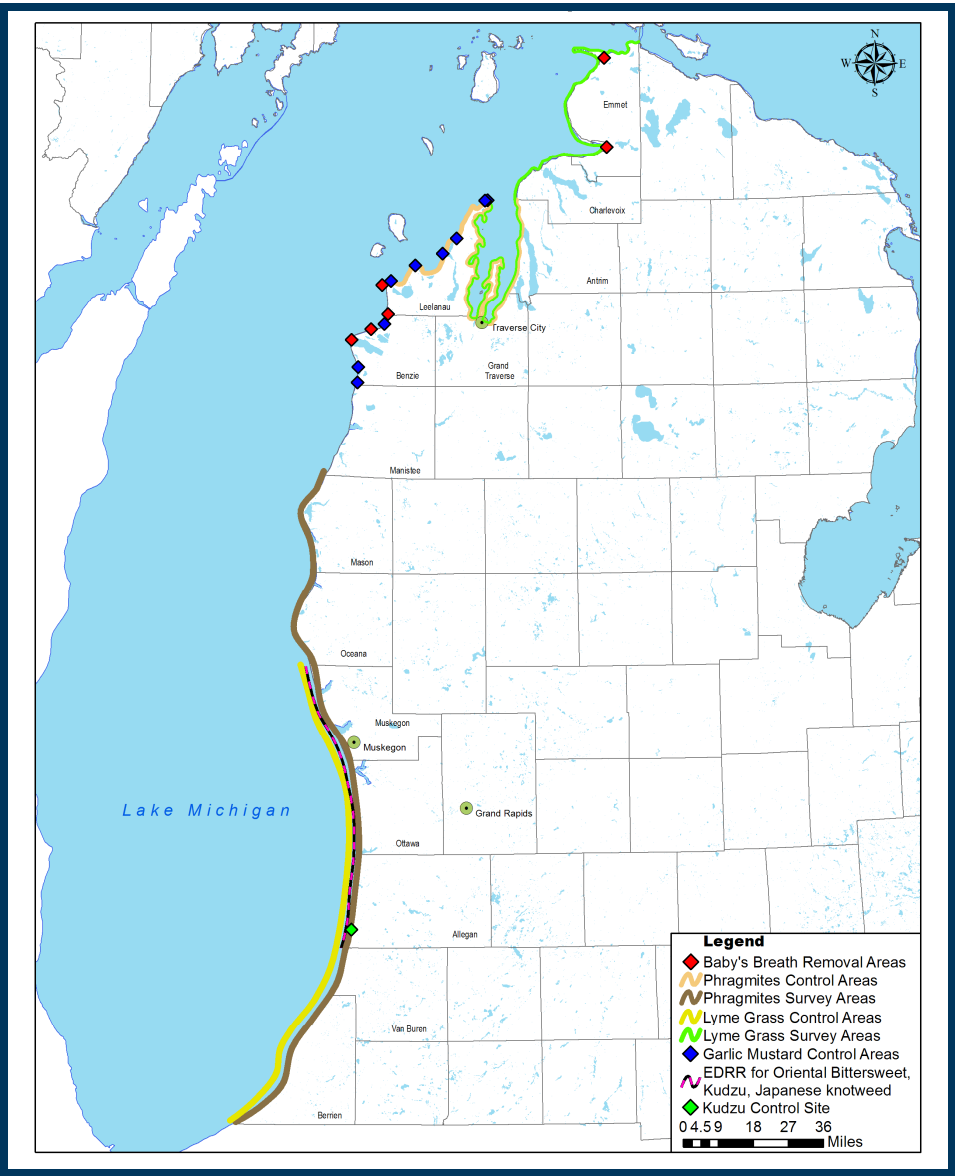
National Fish and Wildlife Foundation

Sustain Our Great Lakes – 2010-2012

National Fish and Wildlife Foundation



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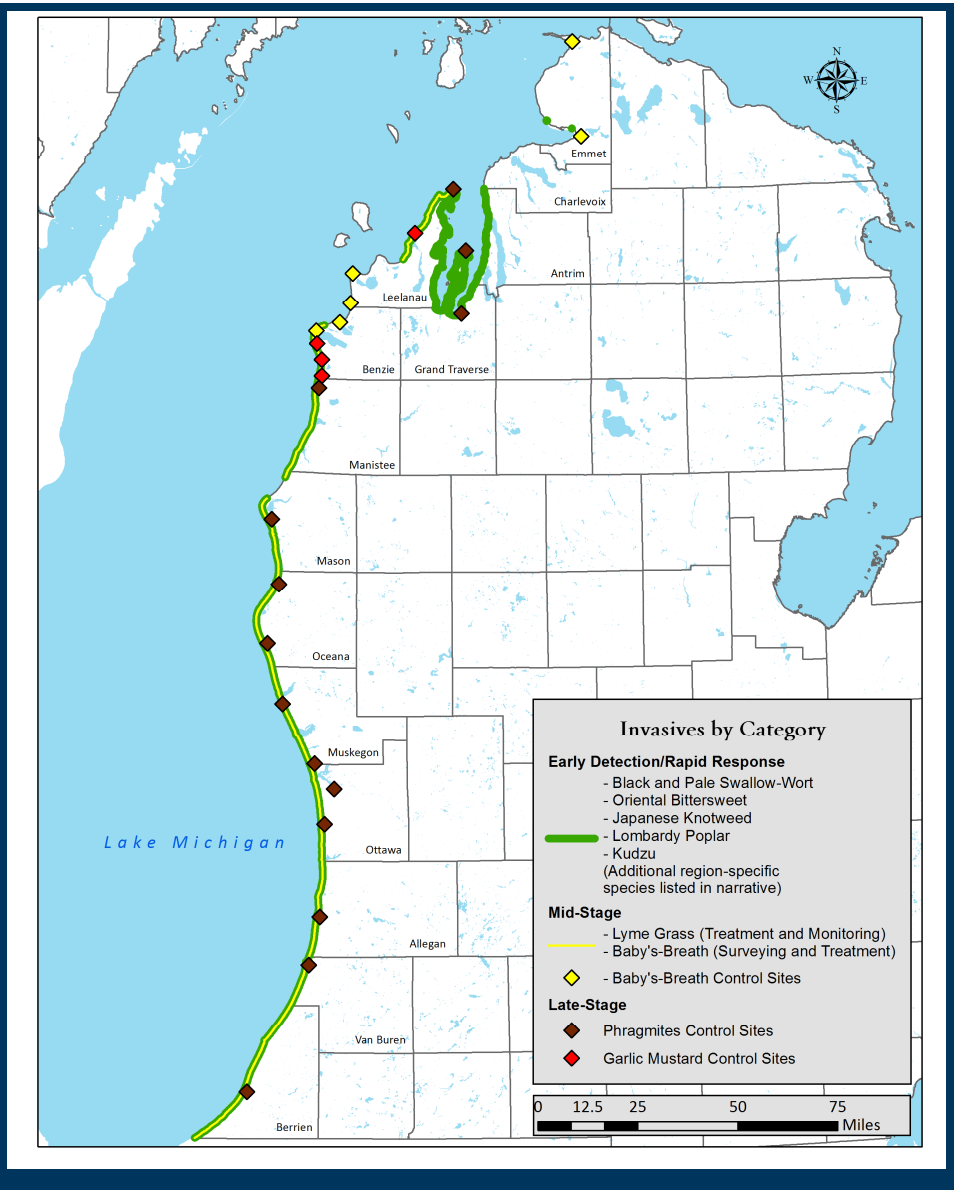
National Fish and Wildlife Foundation

Sustain Our Great Lakes – 2012-2014

National Fish and Wildlife Foundation



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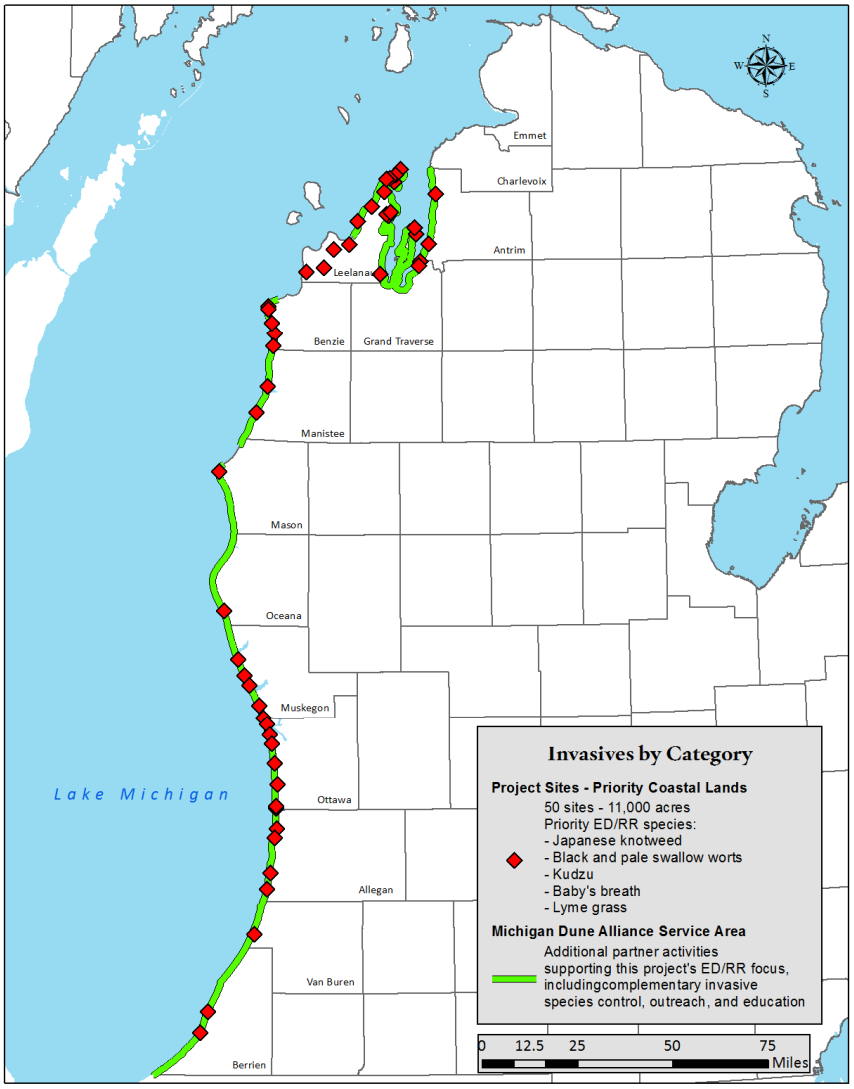
National Fish and Wildlife Foundation

Sustain Our Great Lakes – 2015-2016

National Fish and Wildlife Foundation

Eastern Lake Michigan Project Map



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Early Detection/Rapid Response

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Early Detection/Rapid Response

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SOGL Outcomes-to-Date
(2010-2014)

- Public lands
  - 100+ federal, state, local, and NGO properties
- Private lands
  - 750+ parcels, nearly 11,000 acres
- Total acres surveyed:
  - 50,272

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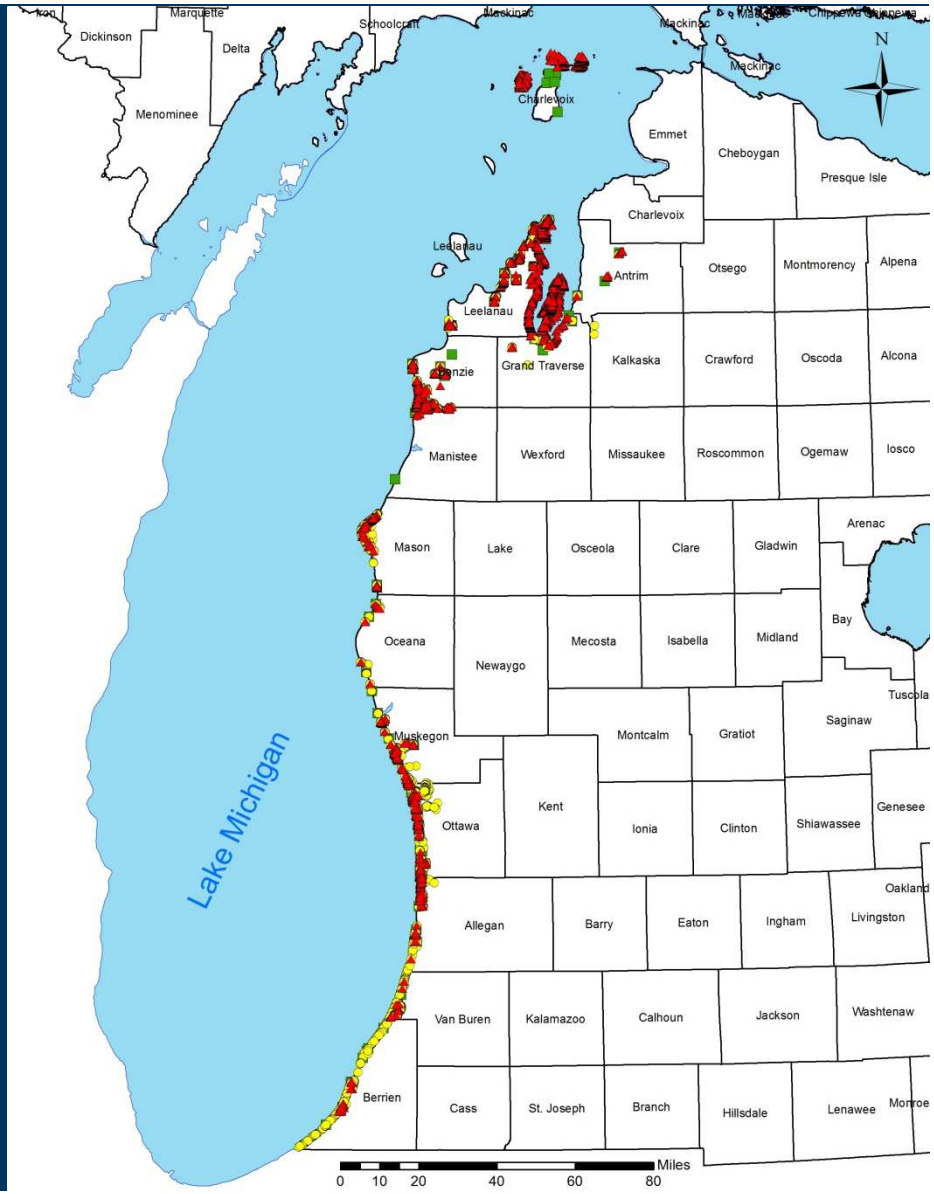
SOGL Outcomes-to-Date
(2010-2014)

- Populations identified
  - 10, 423
  - 15+ different species
- Control implemented
  - 7,788 infestations
  - Many required multiple treatments
- Total percent treated:
  - 75%



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Michigan Dune Alliance partners coordinating restoration activities

Leelanau Conservancy

Grand Traverse Regional Land Conservancy

The Stewardship Network – West Michigan

Southwest Michigan Land Conservancy

Outdoor Discovery Center Macatawa Greenway

National Park Service @ Sleeping Bear Dunes

Michigan DNR – Parks and Rec. Division

US Forest Service @ Manistee National Forest

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MDA Partner's Role

- Project implementation
  - On-the-ground expertise
  - Site-based knowledge
- Outreach and education
  - Increasing awareness
  - Complementary work
- Matching funds
  - 2010-2012 - $250,000
  - 2012-2014 - $500,000

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The Nature Conservancy's Role

- Acquiring funding
  - 2007-2010 - $100,000
  - 2010-2012 - $500,000
  - 2012-2014 - $700,000
  - 2015-2016 - $350,000
- Project design, admin, and direction
- Science and Technical Expertise
  - Prioritization
  - Research

Restoration Ecology
THE JOURNAL OF THE SOCIETY FOR ECOLOGICAL RESTORATION

RESEARCH ARTICLE

Aboveground and Belowground Impacts Following Removal of the Invasive Species Baby's Breath (*Gypsophila paniculata*) on Lake Michigan Sand Dunes

Sarah M. Emery,[1,2] Patrick J. Doran,[3] John T. Legge,[3] Matthew Kleitch,[3] and Shaun Howard[3]

Abstract

The removal of invasive species is often one of the first steps in restoring degraded habitats. However, studies evaluating effectiveness of invasive species removal are often limited in spatial and temporal scale, and lack evaluation of both aboveground and belowground effects on diversity and key processes. In this study, we present results of a large 3-year removal effort of the invasive species, *Gypsophila paniculata*, on sand dunes in northwest Michigan (USA). We measured *G. paniculata* abundance, plant species richness, plant community diversity, non-native plant cover, abundance of *Cirsium pitcheri* (a federally threatened species endemic to this habitat), sand movement, arbuscular mycorrhizal spore abundance, and soil nutrients in fifteen 1000 m^2 plots yearly from 2007 to 2010 in order to evaluate the effectiveness of manual removal of this species on dune restoration. *Gypsophila paniculata* cover was greatly reduced by management, but was not entirely eliminated from the area. Removal of *G. paniculata* shifted plant community composition to more closely resemble target reference plant communities but had no effect on total plant diversity, *C. pitcheri* abundance, or other non-native plant cover. Soil properties were generally unaffected by *G. paniculata* invasion or removal. The outlook is good for this restoration, as other non-native species do not appear to be staging a "secondary" invasion of this habitat. However, the successional nature of sand dunes means that they are already highly invasible, stressing the need for regular monitoring to ensure that restoration progresses.

Key words: CAP, diversity, manual control, mycorrhizae, sand, soils.

Introduction

The removal of invasive species is often one of the first steps in restoring degraded habitats (Hulme 2006). There is a general assumption that the removal of invasive species should lead to an increase in native diversity because of reduced competition from the invader (Hobbs & Huenneke 1992; Jager & Kowarik 2010). However, management-oriented control actions often evaluate only changes in invader densities (Buckley 2008; Kettenring & Adams 2011), at the expense of tracking other aboveground and belowground impacts of removing a dominant invasive species, especially in the long term (Blossey 1999; Zavaleta et al. 2001). "Surprise effects," where there is the rapid increase of prior unnoticed species following the removal of an invasive alien (Caut et al. 2009), as well as secondary invasions by a new invasive species (Masters & Sheley 2001), are possible outcomes of invasive species management. For example, the non-native species *Poa pratensis* quickly increased in abundance after *Coronilla varia*, another invader, had been removed from sand prairie habitat in Illinois (Symstad 2004).

Additionally, belowground responses to invasive species removal are poorly understood within a restoration context (Kardol & Wardle 2010). There are many documented examples of invasive species altering soil nutrient levels (Mack et al. 2001), erosion (Lacey et al. 2003), and soil biodiversity (Grman & Suding 2010). However, examples of monitoring belowground responses after invasive species removal in a restoration context are scarcer (though see examples in Yelenik et al. 2004; Marchante et al. 2008), and in some cases actually indicate short-term undesired consequences of restoration efforts, such as increased erosion (Vincent et al. 2009). An understanding of connections between desired plant community targets in a restoration and key belowground diversity and processes, such as the mutualistic role of mycorrhizal fungi, or nutrient cycling, will enhance our ability to both refine and achieve restoration goals (Kardol & Wardle 2010).

This study reports on both aboveground plant community and belowground soil conditions responses following the

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doi: 10.1111/j.1526-100X.2012.00915.x

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The Future of Coastal Restoration

- Islands
  - Beaver Island
  - Door Peninsula/Green Bay
- Sustainability
  - Economic benefits of invasives removal
- Lake-wide scale
  - Northern and Western Lake Michigan
- Export/Transfer
  - Partnership framework for other Great Lakes coasts

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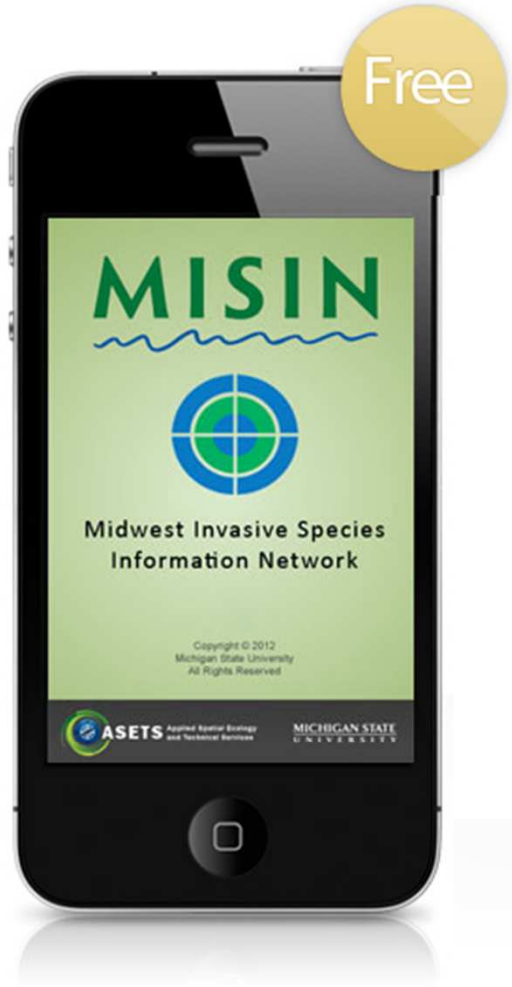
Information Sharing



MISIN

Version 2.1

Midwest Invasive Species Information Network

The MISIN smartphone app provides a mobile solution for the capture of invasive species field observation data. You can play an important role in the early detection and rapid response to new invasive threats in your area by contributing invasive species observations to the MISIN database.

- Identify and report 300+ invasive plant and animal species
- Capture and submit species observations from the field
- Include images taken in the field with your observation
- Browse images and species information on the top Midwest invaders

Available on the App Store

ANDROID APP ON Google play

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Information Sharing

"One stop shop" for invasive species management

MInvasives
Michigan Invasive Species Coalition

MICHIGANINVASIVES.ORG

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